

I claim as my invention:

1. A whole cell computer (WCC) comprising a computing node that operates in a network of many other WCCs of similar or different types, wherein:

- a) the WCC operates by the principles of stochastic dataflow computing;
- b) the WCC is classified as a membrane computer;
- c) the WCC substantially obeys the following basic principles:
  - i. the WCC has at least one membrane bound instruction within it;
  - ii. the WCC instructions convert one or more operands into one or more operand products and may optionally require the presence of additional operands that do not undergo change, and instructions execute upon the arrival of all necessary operands within a proximal distance to the instruction, which distance is determined by rule or instruction.
  - iii. a state vector of the WCC provides information about results or status of which are determined by the statistical aggregate expression level and state vector as a result of the random motion and aggregate execution of instructions;
  - iv. programs are stored as one or more strings of embedded operands in a latent state, and programs execute by arrival of activating or regulating operands;
  - v. the WCC contains a "cache" memory, which maintains a single copy of each individual instruction that is active in a given WCC;
  - vi. the WCC contains at least one of the following types of input-output instruction: 1) Instructions that cause operands to cross membrane boundaries, and/or 2) instructions that respond to ligands;
  - vii. the WCC contains an operating system that provides the mechanism for copying instructions and operands from programs, delivering them to the proper location, and providing the power for their execution upon the arrival of their operands;
  - viii. WCC program execution is massively parallel, distributed, multi-threaded and otherwise contains no central processing unit;

- ix. memory and computing results are stored via the state of WCC in a distributed manner, with short term memory of the WCC being the current state vector, and the the long term memory of the WCC being the active pathways;
  - x. when there are differing types of WCCs in a network, there must be more than ten copies of each type;
  - xi. a WCC is robust to computing errors because there are many copies of any given instruction, operand or WCC in a network;
  - xii. a WCC may cease to function by its own decision if it becomes defective;
- and
- d) the WCC may be programmed by manually fixing the instruction set and operands or through genetic programming.